Additive Manufacturing of 3D Ceramic Structures for Electronic Applications of $YBa_2Cu_3O_7$

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***Abstract*– Multichannel dc-SQUID systems have to be mounted inside a cryostat to be operated below the critical temperature T_c. SQUIDs have to be encapsulated to prevent aging of the high temperature superconducting (HTS) materials. Additive manufacturing offers the opportunity to develop arbitrary structures for sample holders and SQUID capsules to address problems of conventionally manufactured systems. To investigate the potential of additive manufacturing techniques for the use with superconductors for wiring purposes, we developed a 3D-printing process for the high-T_c superconductor $YBa_2Cu_3O_7$. For this purpose we built a 3D-printer with a paste extruder to print different ceramics and printed with this setup substrates out of $SrTiO_3$ dispersed in water and polyethylene glycol. Furthermore, the option to print $YBa_2Cu_3O_7$ with the paste extruder was investigated. For this purpose $YBa_2Cu_3O_7$ was dispersed in different organic solvents and printed on the additive manufactured substrates. Measurements showed that superconducting properties emerged below a T_c of about 84 K. Currently the process is being optimized for larger sample sizes, arbitrary structures and higher current capacity of the superconducting structures.**

***Keywords (Index Terms)*– HTS, additive manufacturing, ceramics, YBCO, SQUID magnetometers.**

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